WHAT IS CLAIMED IS:

1. An apparatus for printing holographic stereograms, comprising:

    a light source that produces a coherent beam;

    a beam splitter that splits the coherent beam into an object beam and a reference beam;

    a material holder holding a holographic recording material having elemental holograms;

    an object beam unit for displaying a rendered image and for conditioning the object beam with the rendered image to interfere with the reference beam at a chosen elemental hologram;

    a reference beam-steering system for directing the reference beam to interfere with the object beam at the chosen elemental hologram; and

    a computer programmed to control the interference of the object beam and the reference beam and the delivery of the rendered image to the object beam unit.

2. An apparatus for printing holographic stereograms as in claim 1, further comprising:

    a first beam shutter placed in the path of the object beam; and

    a second beam shutter placed in the path of the reference beam.

3. An apparatus for printing holographic stereograms as in claim 1, the light source comprising a laser.

4. An apparatus for printing holographic stereograms as in claim 1, further comprising three light sources, each light source being a laser.

5. An apparatus for printing holographic stereograms as in claim 4, one laser producing a blue light, one laser producing a red light, and one laser producing a green light.

6. An apparatus for printing holographic stereograms as in claim 1, the object beam unit including a SLM for displaying the rendered image.

7. An apparatus for printing holographic stereograms as in claim 6, further comprising multiple light sources that produce multiple object beams, said multiple object beams directed at the SLM.

8. An apparatus for printing holographic stereograms as in claim 6, further comprising multiple object beams and multiple SLMs, each object beam directed towards at least one SLM.

9. An apparatus for printing holographic stereograms as in claim 6, the object beam unit including a HOE in the path of the object beam.

10. An apparatus for printing holographic stereograms as in claim 9, the HOE converging and evenly distributing the object beam over the chosen elemental hologram.

11. An apparatus for printing holographic stereograms as in claim 1, the object beam unit including a band-limited diffuser in the path of the object beam and a converging lens in the path of the object beam.

12. An apparatus for printing holographic stereograms as in claim 1, the object beam unit comprising a fiber optic cable that transmits the object beam.

13. An apparatus for printing holographic stereograms as in claim 12, the object beam unit comprising:

multiple light sources that produce multiple object beams;

multiple fiber optic cables, each transmitting a respective object beam;

a singlet lens, a SLM, and a band-limited diffuser in the path of each object beam; and

an optical combiner unit in the path of each of the multiple object beams combining the multiple object beams into a combined object beam that intersects the chosen elemental hologram.

14. An apparatus for printing holographic stereograms as in claim 13, the object beam unit further comprising:

a converging lens in the path of the combined object beam; and

a pair of projection lenses located in the path of the combined object beam between the optical combiner unit and the converging lens.

15. An apparatus for printing holographic stereograms as in claim 14, the object beam unit further comprising, a Fourier transform filter located between the two projection lenses.

16. An apparatus for printing holographic stereograms as in claim 1, the object beam unit comprising a voxel-control lens proximate to the holographic recording material.

17. An apparatus for printing holographic stereograms as in claim 1, the computer comprising at least one central processing unit.

18. An apparatus for printing holographic stereograms as in claim 17, at least one of the central processing units programmed to render the image that is delivered to the object beam unit.

19. An apparatus for printing holographic stereograms as in claim 17, the computer comprising at least one storage device operating to receive the rendered image from at least one of the central processing units.

20. An apparatus for printing holographic stereograms as in claim 19, the object beam unit comprising multiple SLMs, each SLM receiving a rendered image from at least one of the storage devices.

21. An apparatus for printing holographic stereograms as in claim 1, the reference beam-steering system comprising a beam-steering mirror system.

22. An apparatus for printing holographic stereograms as in claim 21, the beam-steering mirror system comprising;

a mirror with a center point, a first axis passing through the center point, and a second axis passing through the center point and orthogonal to the first axis;

a first mount supporting the mirror for rotating the mirror about the first axis; and

a second mount supporting the first mount for rotating the mirror about the second axis.

23. An apparatus for printing holographic stereograms as in claim 22, the first mount including a first motor responsive to the computer that controls the rotation of the mirror about the first axis.

24. An apparatus for printing holographic stereograms as in claim 22, the second mount including a second motor responsive to the computer that controls the rotation of the mirror about the second axis.

25. An apparatus for printing holographic stereograms as in claim 21, the reference beam-steering system further comprising a first beam-steering lens in the path of the reference beam and a second beam-steering lens in the path of the reference beam.

26. An apparatus for printing holographic stereograms as in claim 25, the reference beam-steering system further comprising a reference beam converging lens through which a reference beam passes as it enters the beam-steering system.

27. An apparatus for printing holographic stereograms as in claim 25, the reference beam-steering system further comprising a beam-steering aperture and aperture relay lenses, said reference beam passing through the beam-steering aperture and the aperture relay lenses as it enters the beam-steering system.

28. An apparatus for printing holographic stereograms as in claim 1, the reference beam-steering system comprising:

a fiber optic cable for transmitting the reference beam, the fiber optic cable having an output end;

a translation system for moving said output end; and

a beam-steering lens in the path of the reference beam.

29. An apparatus for printing holographic stereograms as in claim 28, wherein the computer is programmed to control the movement of the translation system.

30. An apparatus for printing holographic stereograms as in claim 28, the reference beam-steering system further comprising a masking plate in the path of the reference beam and proximate to the holographic recording material.

31. An apparatus for printing holographic stereograms as in claim 28, the translation system having a first axis and a second axis orthogonal to said first axis and

including a first-translation stage for translation along the first axis and a second translation stage for translation along the second axis.

32. An apparatus for printing holographic stereograms as in claim 28, further comprising:

a) multiple fiber optic cables for transmitting multiple reference beams, each fiber optic cable having an output end; and

b) an optical combiner unit attached to the translation system and also attached to each fiber optic cable output end.

33. An apparatus for printing holographic stereograms as in claim 1, the material holder comprising a first-translation stage operable in response to the computer to translate the material holder along a first axis.

34. An apparatus for printing holographic stereograms as in claim 33, the material holder comprising a second-translation stage operable in response to the computer to translate the material holder along a second axis that is orthogonal to the first axis.

35. An apparatus for printing holographic stereograms as in claim 1, wherein:

the material holder includes a first-translation stage and two second-translation stages;

the holographic recording material has a front side and a back side, the holographic recording material being attached to the first-translation stage;

at least one object beam unit is fixed to one of the second-translation stages and is located on the front side of the holographic recording material; and

at least one reference-beam steering system is fixed to the other second-translation stage and is located on the back side of the holographic recording material.

36. An apparatus for printing holographic stereograms, comprising:

a light source that produces a coherent beam;

a beam splitter that splits the coherent beam into an object beam and a reference beam;

a material holder holding a holographic recording material having elemental holograms;

an object beam unit, including a removable band-limited diffuser, for displaying a rendered image and for conditioning the object beam with the rendered image to interfere with the reference beam at a chosen elemental hologram;

a removable masking plate located in the path of the reference beam and proximate to the holographic recording material; and

a computer programmed to control the interference of the object beam and the reference beam and the delivery of the rendered image to the object beam unit.

37. An apparatus for printing holographic stereograms as in claim 36, the removable masking plate having at least one positioning adjustment device.

38. An apparatus for printing holographic stereograms, as in claim 36, the removable band-limited diffuser having at least one positioning adjustment device.

39. An apparatus for printing holographic stereograms, comprising:

a light source that produces a coherent beam;

a beam splitter that splits the coherent beam into an object beam and a reference beam;

a material holder holding a holographic recording material having elemental holograms;

an object beam unit for displaying a rendered image and for conditioning the object beam with the rendered image to interfere with the reference beam at a chosen elemental hologram;

a voxel-control lens located in the path of the object beam and proximate to the holographic recording material; and

a computer programmed to control the interference of the object beam and the reference beam and the delivery of the rendered image to the object beam unit.

40. An apparatus for printing holographic stereograms as in claim 39, wherein:

the object beam unit includes a SLM for displaying the rendered image; and

the voxel-control lens has a focal length about equal to the distance between the voxel-control lens and the SLM.

41. An apparatus for printing holographic stereograms as in claim 39, wherein:

the object beam unit includes a SLM for displaying the rendered image; and

the voxel-control lens has a focal length about equal to the distance between the voxel-control lens and the image of the SLM.

42. An apparatus for printing holographic stereograms, comprising:

a light source that produces a coherent beam;

a beam splitter that splits the coherent beam into an object beam and a reference beam;

a material holder holding a holographic recording material having elemental holograms;

an object beam unit, including a removable band-limited diffuser, for displaying a rendered image and for conditioning the object beam with the rendered image to interfere with the reference beam at a chosen elemental hologram;

a voxel-control lens located in the path of the object beam and proximate to the holographic recording material;

a removable masking plate located in the path of the reference beam and proximate to the holographic recording material;

a reference beam-steering system for directing the reference beam to interfere with the object beam at the chosen elemental hologram; and

a computer programmed to control the interference of the object beam and the reference beam and the delivery of the rendered image to the object beam unit.

43. An apparatus for printing holographic stereograms, comprising:

a plurality of light sources, each producing a different colored coherent beam;

an optical combiner that combines the plurality of beams into a combined beam;

a beam splitter that splits the combined beam into an object beam and a reference beam;

a material holder holding a holographic recording material capable of recording in color and having elemental holograms;

an object beam unit, for displaying a rendered image and for conditioning the object beam with the rendered image to interfere with the reference beam at a chosen elemental hologram;

a computer programmed to control the interference of the object beam and the reference beam and the delivery of the rendered image to the object beam unit.

44. An apparatus for printing holographic stereograms as in claim 43, said plurality of light sources being at least three in number.

45. An apparatus for printing holographic stereograms as in claim 43, said object beam unit including a full-color SLM and achromatic optics.

46. An apparatus for printing holographic stereograms, comprising:

a plurality of light sources, each producing a different colored coherent beam;

a beam splitter that splits each coherent beam into an object beam and a reference beam;

an optical combiner that combines the reference beams into one combined reference beam;

a material holder holding a holographic recording material capable of recording in color and having elemental holograms;

an object beam unit producing a combined object beam that interferes with the combined reference beam;

a computer programmed to control the interference of the combined object beam and the combined reference beam and the delivery of the rendered image to the object beam unit.

47. An apparatus for printing holographic stereograms as in claim 46, said plurality of light sources being at least three in number.

48. An apparatus for printing holographic stereograms as in claim 46, said object beam unit including achromatic optics, a SLM for each object beam, and an optical combiner that combines all the object beams into a combined object beam.

49. An apparatus for printing holographic stereograms as in claim 46, said object beam unit displaying a full-color, rendered image and conditioning each object beams with a rendered image and including a HOE in the path of all of the object beams and that converges all the object beams at the chosen elemental hologram.

50. A method of printing a holographic stereogram with elemental holograms, comprising the steps of:

selecting an elemental hologram;

generating a coherent light beam;

splitting the beam into an object beam and a reference beam;

rendering an image;

conditioning the object beam with the rendered image;

selectively steering the reference beam at the selected elemental hologram; and

interfering the conditioned object beam with the reference beam at the selected elemental hologram.

51. The method of claim 50, further comprising the steps of:

shielding the holographic recording material from the object beam;

shielding the holographic recording material from the reference beam; and

translating the holographic material relative to the object beam to select another elemental hologram.

52. The method of claim 50, the step of conditioning the object beam comprising the step of interacting the object beam with a SLM.

53. The method of claim 50, the step of conditioning the object beam comprising the step of interacting the object beam with a band-limited diffuser.

54. The method of claim 50, the step of conditioning the object beam comprising the step of interacting the object beam with a HOE.

55. The method of claim 54, the step of interacting the object beam with a HOE comprising the steps of converging the object beam and evenly distributing the object beam towards the selected elemental hologram.

56. The method of claim 50, the step of conditioning the object beam comprising the step of passing the object beam through a voxel-control lens.

57. A method of printing a holographic stereogram with elemental holograms, comprising the steps of:

selecting an elemental hologram;

generating a coherent light beam;

splitting the beam into an object beam and a reference beam;

rendering an image;

conditioning the object beam with the rendered image, the conditioning of the object beam including the step of passing the object beam though a voxel-control lens;

interfering the conditioned object beam with the reference beam at the selected elemental hologram.

58. A method of generating an animated holographic stereogram with elemental holograms, comprising the steps of:

selecting viewing zones;

for each viewing zone, selecting a scene viewable from the viewing zone;

generating computer models of each scene; and

for each elemental hologram:

determining viewing zone mask volumes;

rendering an image of the scene enclosed by each of the viewing zone mask volumes; and

after rendering is complete for each viewing zone mask volume of an elemental hologram, compositing the rendered images for that elemental hologram.

59. A method of printing an animated holographic stereogram with elemental holograms, comprising the steps of:

selecting an elemental hologram;

generating a coherent light beam;

splitting the beam into an object beam and a reference beam;

determining viewing zone mask volumes for each elemental hologram;

rendering images for each viewing zone mask volume of each elemental hologram;

compositing the rendered images of the viewing zone mask volume of an elemental hologram into a composite image;

conditioning the object beam with the composite image;

selectively steering the reference beam at the selected elemental hologram; and

interfering the conditioned object beam with the reference beam at the selected elemental hologram.

60. The method of claim 59, further comprising the steps of:

shielding the holographic recording material from the object beam;

shielding the holographic recording material from the reference beam; and

translating the holographic material relative to the object beam to select another elemental hologram.

61. A method of printing a holographic stereogram with elemental holograms, comprising the steps of:

selecting an elemental hologram;

generating a plurality of coherent light beams;

combining the light beams into one combined beam;

splitting the combined beam into an object beam and a reference beam;

rendering an full-color image;

conditioning the object beam with the rendered image; and

interfering the conditioned object beam with the reference beam at the selected elemental hologram.

62. A method of printing a holographic stereogram with elemental holograms, comprising the steps of:

selecting an elemental hologram;

generating a plurality of coherent light beams;

splitting the each coherent light beam into an object beam and a reference beam;

rendering a plurality of images;

conditioning each object beam with one rendered image;

combining all the conditioned object beams into one combined object beam;

combining all the reference beams into one combined reference beam; and

interfering the combined object beam with the combined reference beam at the selected elemental hologram.